Memo

Project: RDP Tributaries & Upper RDP CSO Controls & Lower Meramec System Improvements (11153) Project

WO 4 – DC-02 & DC-03 Sanitary Relief (Brentwood Blvd. to Conway Rd.) Ph. III & IV (12472) Design

Subject: Alternative Alignment Analysis and Alignment Recommendations –DRAFT

Date: Monday, December 28, 2015

This Technical Memorandum (TM) analyzes, evaluates, and compares alternative alignments to the previous alignment recommendations for the DC-02 and DC-03 Sanitary Relief Sewer, Phases III and IV, as defined in the Alignment Recommendations, DC-02 Deer Creek Sanitary Relief (10021) TM prepared for MSD dated March 2013. This TM also evaluates the current phasing and makes a recommendation for final phasing for construction of the DC-02 and DC-03 Sanitary Relief Sewer, Phases III and IV.

The recommendations presented in this TM will provide the starting point for the preparation for construction documents. This TM is organized as follows:

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Summary

The alignment recommended in this TM is a solution to meet the combined objectives of being cost effective, constructible and providing good access for future maintenance. To reduce overall costs and to reduce the construction schedule, most of this project can be constructed "in the dry" which will minimize bypass pumping costs and increase the rate of construction. The project schedule needs to be minimized as much as possible to ensure that the SSOs noted in the Consent Decree can be removed by December 31, 2023. There are a number of obstacles and utilities along the project corridor that impact the recommended alignment of this sanitary relief sewer. Once the topographic survey is completed the alignment will need to be refined to avoid as many of the obstacles as possible, but some utility relocation is still anticipated to be required to construct this project.

Background

Existing Deer Creek Trunk Sanitary Sewer Alignment

The existing DC-02 and DC-03 Deer Creek trunk sanitary sewer (trunk sewer) alignment begins at Manhole 21L2-001S, which is located on the south side of Deer Creek immediately east of the Two Mile Creek confluence. At this manhole the existing 42-inch diameter trunk sewer intercepts the 30-inch diameter Two Mile Creek trunk sewer and then continues in a northwesterly direction across Two Mile Creek as a 27-inch diameter sewer.

West of Two Mile Creek the trunk sewer follows the rear property line of the large lot properties on the north side of Overbrook Drive and then crosses under Litzsinger Road just west of the existing bridge. About 600 feet upstream of Litzsinger Road the trunk sewer crosses the main channel of Deer Creek and continues along the north side of the channel a distance of about 1,200 feet before splitting into two trunk sewers at Manhole 20L4-030S; the "north" trunk sewer and the "south" trunk sewer, as shown on Figure 1. The north trunk sewer, which leaves the

manhole as a 21-inch diameter sewer, continues in a northwesterly direction a distance of about 550 feet; crossing the Deer Creek channel twice before turning north and crossing an abandoned railroad right-of-way. The north trunk sewer then continues along the north side of the abandoned railroad right-of-way to Log Cabin Lane.

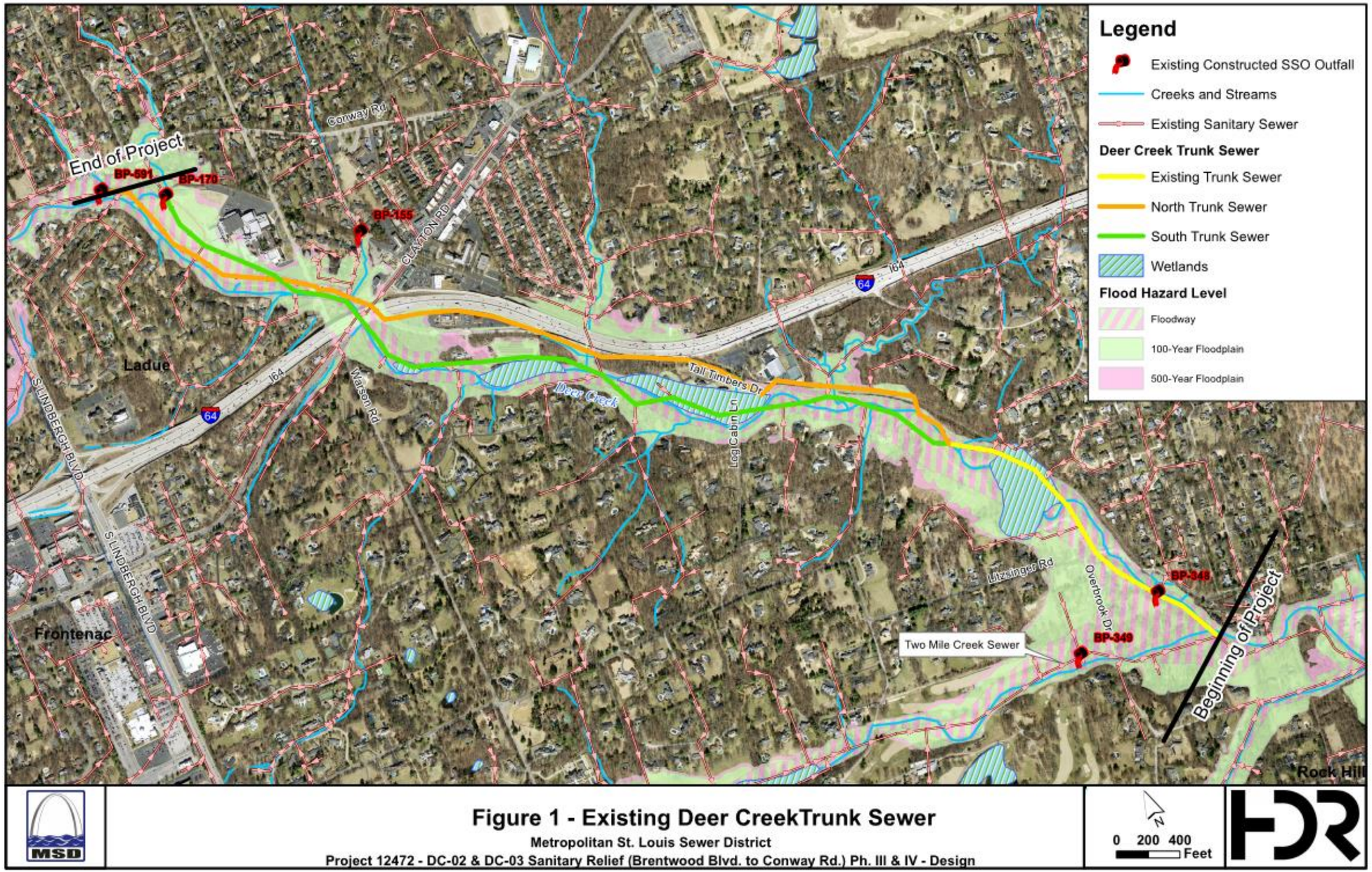


Figure 1 - Existing Deer CreekTrunk Sewer

Metropolitan St. Louis Sewer District

Project 12472 - DC-02 & DC-03 Sanitary Relief (Brentwood Blvd. to Conway Rd.) Ph. III & IV - Design

The south trunk sewer, which leaves Manhole 20L4-030S as a 24-inch diameter sewer, immediately crosses the Deer Creek channel and generally follows the stream alignment a distance of about 2,200 feet to Log Cabin Lane. Along this route it crosses the Deer Creek channel four times, switching back and forth between the north and south sides of the stream. The south trunk sewer crosses Log Cabin Lane about 250 feet south of the north trunk sewer crossing of Log Cabin Lane.

Upstream of Log Cabin Lane the north trunk sewer runs along Tall Timbers Drive and the south trunk sewer cuts across the backyards of the lots in the Tall Timbers Subdivision. The trunk sewers are both 24-inches in diameter at this point. The south trunk sewer continues in a northwesterly direction through mostly wooded areas to the location where I-64 crosses over Clayton Road. Along this route the south trunk sewer crosses the City of Ladue's mulch storage site and the Deer Creek channel.

Upstream of the Tall Timbers Subdivision the north trunk sewer follows the I-64 right-of-way; going to the north of the L'Ecole Culinaire School. The north and south trunk sewers come closer together where they pass under the I-64 bridge over Clayton Road. At this location the south trunk sewer has decreased to a 21-inch diameter sewer while the north trunk sewer is still 24-inches in diameter.

Upstream of Clayton Road the south trunk sewer is located in the Deer Creek channel and the north trunk sewer is located in the backyards of the houses on Foxboro Road. The trunk sewers continue in a northwesterly direction to their crossing of Warson Road. About 300 feet upstream of Warson Road the trunk sewers cross each other on the southern portion of the Ladue Horton-Watkins High School property.

Both trunk sewers cross the high school property; with the south trunk sewer crossing the track and football field and the north trunk sewer located just to the west of the grandstand near the Deer Creek channel. The south trunk sewer, now located north of the north trunk sewer, continues in a northwesterly direction to Manhole 19M3-002S, which contains a constructed Sanitary Sewer Overflow (SSO) known as SSO BP-170. The north trunk sewer also continues in a northwesterly direction to Manhole 19M1-184S, which contains a constructed SSO known as SSO BP-591. Upstream of Manhole 19M1-184S the trunk sewer is a 48-inch diameter sewer. The upstream project limits are at Manhole 19M1-184S on the north trunk sewer and Manhole 19M3-002S on the south trunk sewer.

Alignment Recommendations, DC-02 Deer Creek Sanitary Relief (10021) TM Dated March 2013

This Alignment Recommendations Technical Memorandum discusses the sanitary relief sewer construction recommendations presented in the DC-02 Deer Creek Sanitary Relief Preliminary Design Report (90017) prepared by HDR, Inc. in 2008 and a portion of the Preliminary Engineering Report for the DC-03 Deer Creek Sanitary Relief Project (89133) prepared by

Burns and McDonnell, Inc. in 2004. These recommendations were made to relieve surcharging and eliminate SSOs within the Deer Creek Watershed.

This Technical Memorandum also discusses changes to the previous sanitary relief sewer corridors, recent changes to the existing Deer Creek trunk sewer, utility conflicts and conflicts with existing sewers, and potential alignment alternatives and required easements that differ from the two reports listed above and the reasons the changes may be warranted. This TM further analyzes, evaluates, and compares alternative alignments to the previous alignment recommendations in the Alignment Recommendations, DC-02 Deer Creek Sanitary Relief (10021)TM dated March 2013, prepared by Parsons.

Schedule

Table 1 identifies the design and construction schedule for the DC-02 and DC-03 Sanitary Relief Sewer in order to eliminate the five associated Phase III and Phase IV constructed SSOs (BP-155, BP-170, BP-348, BP-349, and BP-591) by the CD mandated milestone date of December 31, 2023.

Table 1 – DC-02 & CD-03 Sanitary Relief Sewer Schedule, Phases III and IV Combined

Deer Creek DC-02 & DC-03 (Phases III and IV)	CD Rqmt	Planned
Design Start		9/11/2015
Alignment Recommendation TM		12/28/2015
30% Design		4/4/2016
60% Design		10/3/2016
90% Design		1/24/2017
Appraisals (2 months)		3/24/2017
Easements (20.5 months)		10/08/2018
100% Design		11/30/2018
Bid/Advertise/Award		5/31/2019
Construction Start		6/1/2019
Construction Complete		12/1/2022
Placement in Service	12/31/2023	12/1/2022

DC-02/03 Connection Analysis (SSO Elimination TM)

The DC-02/03 Sanitary Relief Sewer project is required to relieve the Deer Creek Trunk Sewer and to eliminate seven constructed sanitary sewer overflows (SSOs) from the existing sanitary sewer system. One SSO each on Phases I and II, two SSOs on Phase II, and three SSO's on Phase IV. The sanitary relief sewer project will be constructed in four phases (As recommended in the Construction Phasing section of this TM, Phase III and IV will be bid as one project). However, the project will not become fully operational until completion and ultimate connection to the Deer Creek Sanitary Tunnel project. The seven SSOs within the project area are identified in the Consent Decree as requiring removal by 12/23/2023.

Table 2 lists the SSOs required for removal and the phase of construction that the SSO is located. The purpose of the connection analysis was to determine the earliest each of the seven SSOs can be eliminated from the existing system and when the new sanitary relief sewer can be effectively put online. The feasibility of making connections to existing facilities and elimination of SSOs during construction depends on several regulatory requirements.

Table 2 - Sanitary Sewer Overflows

ID	DC 02/03 Construction Phase	Memo Analysis Phase
BP-155	Phase IV	Phase IV Connection
BP-170	Phase IV	Phase III Connection
BP-198	Phase II	Phase III Connection
BP-348	Phase III	Phase III Connection
BP-349	Phase III	Two Mile Connection
BP-545	Phase I	Sebago Connection
BP-591	Phase IV	Phase IV Connection

Both construction sequencing and the SSO Removal impacts both overflow volume and system hydraulic grade line (HGL) in the downstream system. The regulatory requirements (No increase in overflow volume downstream) dictate the SSO removal sequencing. Based on the construction schedules, the recommended SSO removals are summarized on Table 3, SSO Removal Plan. The recommendations are based on the information developed through the connection analysis, the regulatory requirements and the construction sequencing identified by the Watershed Consultants. Following the SSO removal plan outlined below, the SSOs will be removed prior to the Latest Removal date identified in the SSO Control Master Plan.

Table 3 - SSO Removal Plan

ID	DC 02/03 Construction Phase	Required Removal Action	Earliest Removal Date	Latest Removal Date
BP-155	Phase IV	Completion of Phase IV	12/1/2022	9/7/2023
BP-170	Phase IV	Completion of Phase IV	12/1/2022	9/7/2023
BP-198	Phase II	After Phase III construction to SSO or Tunnel Completion	6/1/2021*	9/7/2023
BP-348	Phase III	After Phase III construction to SSO or Tunnel Completion	10/22/2021	9/7/2023
BP-349	Phase III	After Phase III construction to SSO or Tunnel Completion	6/1/2021*	9/7/2023
BP-545	Phase I	After Tunnel Completion	10/22/2021	9/7/2023
BP-591	Phase IV	Completion of Phase IV	12/1/2022	9/7/2023
*After Two Mile Connection is Made				

Alternative Alignment Analysis

Preliminary Conference Field Visit

A preliminary conference field visit was conducted on September 11, 2015. Personnel from MSD, HDR, EDSI, M3, and MSD's construction manager, Black & Veatch, were in attendance. During the field visit, the previously proposed sanitary relief sewer alignment was walked and potential alignment alternatives were discussed. In addition, the impacts of recent construction and utility conflicts along the alignment were reviewed.

An in-depth review of potential alignment alternatives between the beginning of Phase III and Litzsinger Road, including along Overbrook Drive, was performed. Between Litzsinger Road and Log Cabin Lane, possible utilization of the former railroad right-of-way (ROW) versus the existing alignment across the Litzsinger Road Ecology Center was also evaluated. Potential alternative alignments were also evaluated for the crossing of I-64 in the vicinity of Warson and Clayton Roads due to recent reconstruction of I-64 and new construction along Clayton Road. Alternative Alignment Field Visit Notes are included in Appendix B.

Two Mile Creek to Log Cabin Lane

This reach of the DC-02 and DC-03 alignment commences on the south side of the Deer Creek channel immediately east of the Two Mile Creek confluence. The Two Mile Creek sanitary sewer will connect to the new DC-02 and DC-03 sanitary relief sewer at this location. West of Two Mile Creek the previously recommended alignment follows the rear property line of the large lot properties on the north side of Overbrook Drive for a distance of about 700 feet and then crosses the Deer Creek channel. After crossing the stream channel, the alignment turns

sharply to the northwest and follows an abandoned railroad right-of-way for a distance of about 4,600 feet to Log Cabin Lane. The portion of this alignment, which lies in the abandoned railroad right-of-way, will require significant rock excavation along its length; in excess of 25 feet at some locations.

In addition to a proposed DC-02 and DC-03 alignment, the previous Technical Memorandum recommended a 48-inch diameter relief sewer along Two Mile Creek. The recommended alignment for the Two Mile Creek relief sewer extends west from the DC-02 and DC-03 sanitary relief sewer a distance of about 1,300 feet along the north side of the Two Mile Creek channel to a constructed SSO BP-349 at Manhole 21L1-039S; located about 380 feet west of Overbrook Drive.

During the District's review of the previously recommended alignment, the District's Construction Department requested that three alternate alignments be considered in addition to the recommended alignment. These three alignment alternatives, identified as Legs A, B and C in Figure 2, are described as follows:

Leg A - shifts roughly 1,200 feet of the previously recommended alignment near its upstream end north about 50 feet, into a lower lying area north of the abandoned railroad right-of-way and closer to the existing sanitary sewer.

Leg B - shifts the most upstream end roughly 3,800 feet of the previously recommended alignment to the south side of the Deer Creek channel and into a large lot residential area.

Leg C - this alternate alignment takes the DC-02 and DC-03 Sanitary Relief Sewer west along the north bank of Two Mile Creek to Overbrook Drive, then north on Overbrook Drive, across Litzsinger Road and the Deer Creek channel. Once on the north side of the stream the alignment continues northwesterly, roughly paralleling the stream, to the point where it joins the previously described Legs A and B.

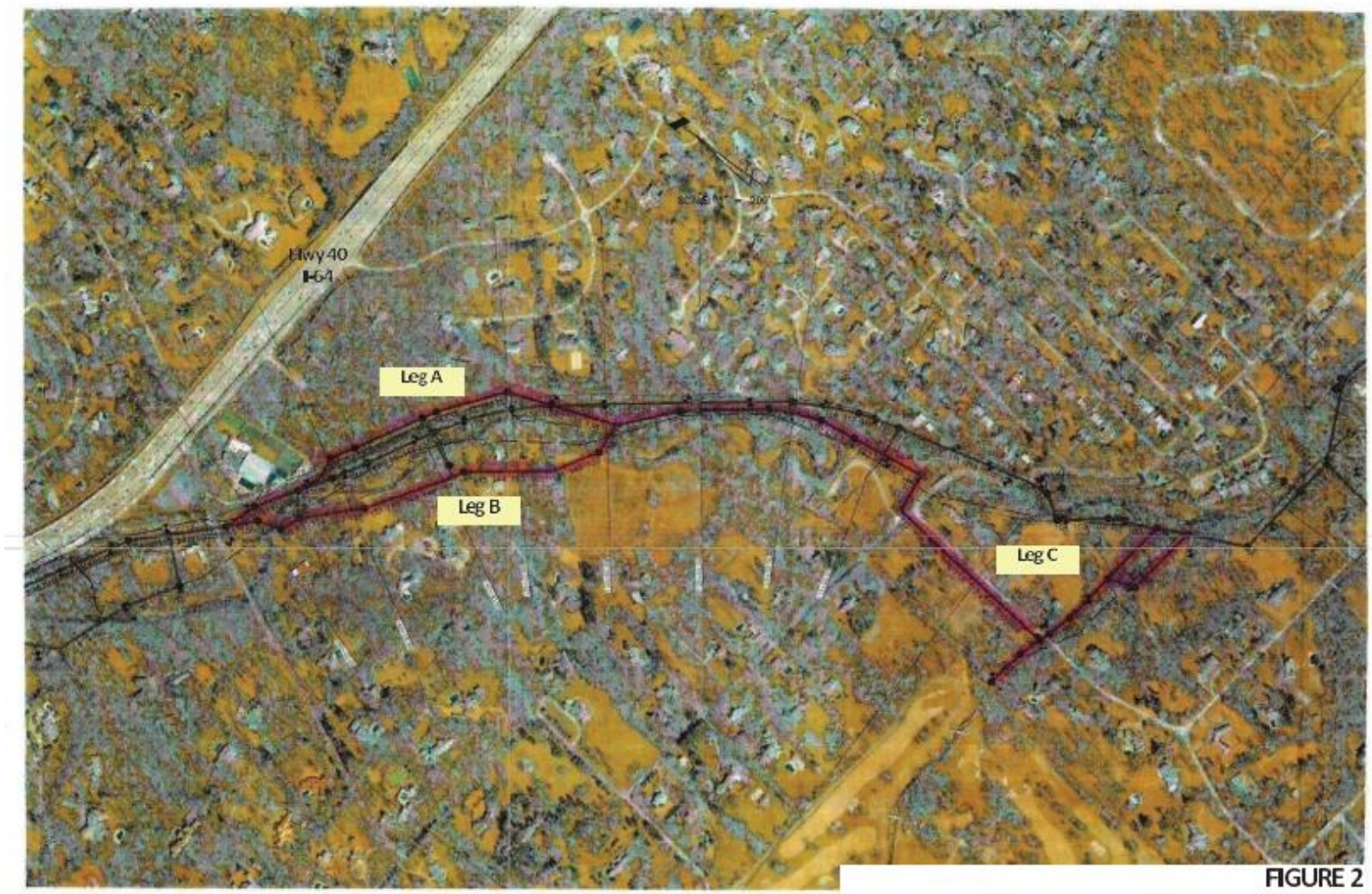


FIGURE 2
CURRENT AND ALTERNATE PROPOSED
ALIGNMENTS FOR DC-02 DC-03 PHASE III

The alternate alignments evaluated in this Alternatives Alignment Analysis are essentially the same as those suggested by the District's Construction Department.

Construction cost, constructability issues and property owner impacts are the most significant considerations for recommending a preferred alignment. To a lesser degree, the evaluation of each alignment should consider the number of stream crossings and the length of existing sewer that can be abandoned; as these can have a significant impact on the long term operation and maintenance costs of the system. Rock excavation cost will be greater for those alignments which lie along the abandoned railroad right-of-way.

Legs A and B

Legs A and B are alternate alignments for the most upstream roughly 2,200 feet of previously recommended alignment. The only difference between Leg A and the recommended alignment in this reach is that for most of its length the Leg A alignment is shifted a small distance either north or south to a location outside of the abandoned railroad right of way. The Leg B alignment would be constructed on the south side of Deer Creek in the lower lying flood plain where the ground surface elevations are generally 8 to 12 feet lower than what they are along the recommended alignment.

The pros and cons for the three alignments being considered for this reach are as follows:

Previously Recommended Alignment:

Pros

- Least impact to property owners
- No stream crossings

Cons

- Largest amount of excavation (rock and earth)
- Highest estimated construction cost
- Narrow construction corridor with underground fiber optic lines and overhead utilities

Leg A:

Pros

- No stream crossings

Cons

- Impacts 7 property owners
- Longest alignment
- Second highest estimated construction cost

Leg B:

Pros

- Shortest alignment
- Lowest estimated construction cost
- Results in most abandoned sewer
- Least amount of total excavation and rock excavation

Cons

- Impacts 7 property owners
- Has two stream crossings

Leg C

Leg C is an alternate alignment to the downstream roughly 3,300 feet of the previously recommended alignment. The Leg C alignment would be constructed south of the abandoned railroad alignment in areas where the ground surface is generally 8 to 10 feet lower than the ground surfaces along the previously recommended alignment. The downstream 2,000 feet of the Leg C alignment would be constructed on the large residential lots which front Overbrook Drive between Two Mile Creek and Litzsinger Road. It is recommended that the portion of Leg C along Overbrook Drive be constructed on the west side of the roadway outside of the existing road right of way. This location will require the acquisition of easements from the four lots on the west side of the roadway.

Three of these four lots are vacant and may remain vacant in the future since they lie within a FEMA designated 100-year floodplain.

Construction of the Leg C alignment to the west of the roadway will eliminate the need to: 1) relocate the existing 6-inch water line and 6-inch gas line located in the road right of way; and 2) provide granular backfill in the sewer trench. It is anticipated that the Leg C alignment will be tunneled across the Litzsinger Road right of way. North of Litzsinger Road Leg C extends about 500 feet across mostly open fields owned by the Litzsinger Road Ecological Foundation prior to crossing of the Deer Creek channel. After crossing to the east side of the stream, the Leg C alignment continues in a northwesterly direction across a low lying overbank for a distance of about 1,200 feet to the point where it connects to either Leg A or Leg B. The Leg C alignment eliminates the need to construct the downstream 850 feet of the proposed 48-inch diameter Two Mile Creek sanitary relief sewer shown in the previous Alignment Recommendations Technical Memorandum.

The pros and cons for the two alignments being considered for this reach are as follows:

Previously Recommended Alignment:

Pros

- Shorter alignment
- Less susceptible to flooding during construction

Cons

- Larger amount of rock excavation.
- Higher estimated construction cost
- Requires a separate Two Mile Creek sanitary relief sewer east of Overbrook Drive
- Narrow construction corridor with fiber optic lines and overhead utilities
- Requires an additional stream crossing

Leg C:

Pros

- Has least number of stream crossings
- Eliminates the need for a separate Two Mile Creek sanitary relief sewer east of Overbrook Drive (+/- 850 feet of 48-inch diameter pipe)
- More open, accessible construction corridor
- Results in the most abandoned sewer
- Minimal utility conflicts

Cons

- Longest alignment

Log Cabin Lane to Ladue Mulch Site Entrance

Along this section there are few alternatives to the previously recommended alignment. The major exception is along Tall Timbers Drive, located west of Log Cabin Lane. Tall Timbers Drive is a private cul-de-sac with only one entrance located on Log Cabin Lane and is located adjacent to the south side of the former railroad ROW. It has an entrance gate at Log Cabin Lane. The ROW has overhead electric, a fiber optic line, and mature trees that act as a sight and noise barrier to the Racquet Club Ladue and I-64 located just to the north and cannot be removed. Along the south edge of Tall Timbers Drive there are 2-inch gas and 6-inch water lines that serve residents along the road.

Two alternatives have been identified. Alternative 1 runs along Tall Timbers Drive and Alternative 2 runs just south of Tall Timbers Drive. The pros and cons of each of the alignments are as follows:

Alternative 1

Pros

- Alignment is further from existing residences, reducing impact of construction activities
- Does not impact driveways

Cons

- May require relocation of gas and water lines
- May require replacement of entrance gate
- May require bypass pumping due to impact on existing sewer
- Closure of Tall Timbers Drive will require temporary road access to be maintained to residences.
- Highest cost

Alternative 2

Pros

- Avoids water and gas lines as well as entrance gate
- Allows Tall Timbers Drive to remain open
- Avoids impacting existing trunk sewer, reducing need for bypass pumping
- Lowest cost

Cons

- Moves sewer alignment closer to existing residences
- Impacts driveways

Due to the construction extents, assumed to be 60 feet, construction of the sewer along Alternative 2 would be close to the existing residences along Tall Timbers Drive. Therefore, Alternative 1 is recommended.

West of Tall Timbers Drive the previously recommended alignment is generally followed. At the Ladue Mulch Facility, the lateral sewer crossing the property from the south has been revised so that it connects to the trunk sewer just west of the entrance to South 40 Drive, reducing disruption to the facility. The remaining lateral sewer connections along this section of the alignment will need further evaluation to determined if they need to be built or if the existing sewer can be rehabilitated.

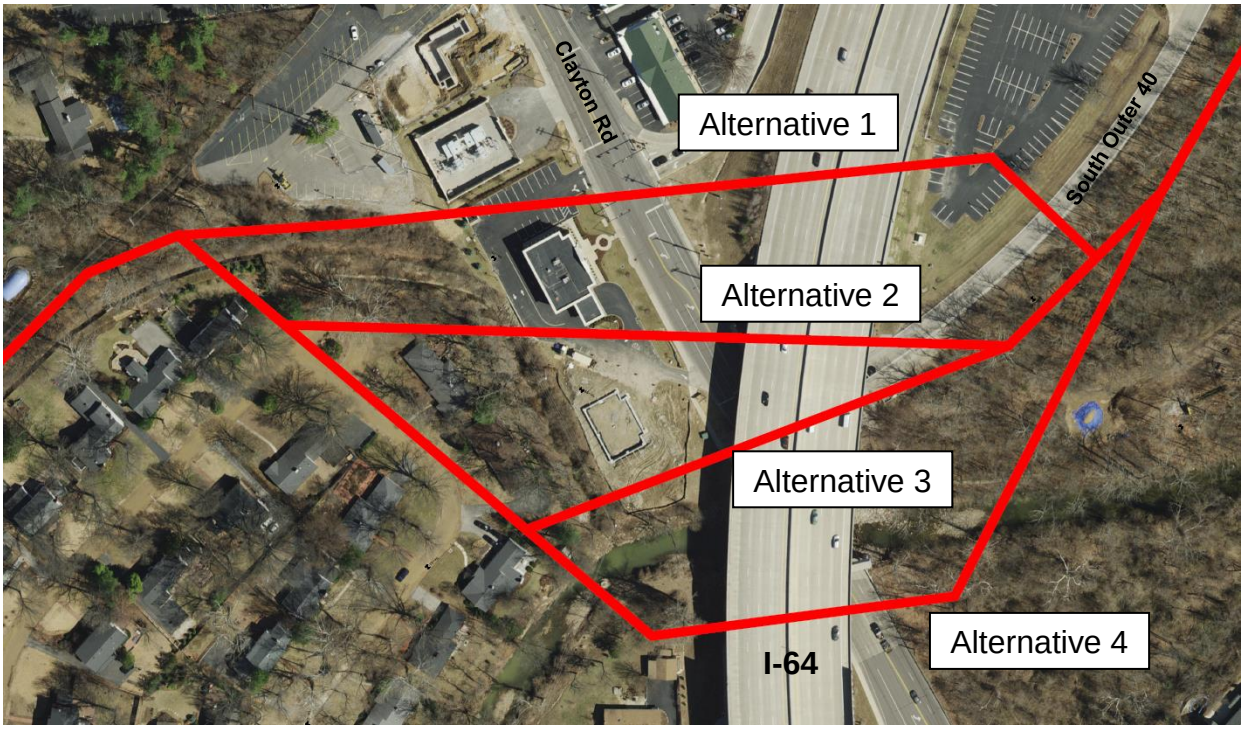
Ladue Mulch Site Entrance to Ladue Horton-Watkins High School

The previously recommended alignment through this section of the project followed South Outer Forty Drive, crossed Clayton Road under the I-64 Bridge, turned easterly behind Heartland Bank, and traversed the Ameren corridor the remainder of project to SSO BP-591 behind Ladue-Horton Watkins High School.

This section is further complicated with construction a new strip mall on the north side of Clayton Road. The strip mall was constructed after the March 2013 Alignment Recommendations TM. Either tunnel or open-cut construction behind the new strip mall would be problematic due to lack of working room, new retaining walls and disruption of active commercial businesses.

Four alternative alignments have been reviewed within this section of the project corridor, as shown in Figure 3. All four alignment alternatives focus on traversing through intersections of South Outer Forty Drive, I-64, and Clayton Road. Cost (Total Length and Tunnel Length), constructability issues and property owner impacts are the most significant considerations for recommending a preferred alignment. Rock excavation will have little impact on alignment selection. However, there is a potential for mixed-face conditions when tunneling due to the estimated elevation of rock and the depth of the sewer that makes tunneling a higher risk alternative.

Figure 3 – Alignment Alternatives (Ladue Mulch Site Entrance to Ladue Horton-Watkins High School)



Alternative 1 – Tunnels under South Outer Forty Drive and Under I-64 and Clayton Road east of the east I-64 bridge abutment and traverses between Heartland Bank and the Ameren Substation to the Ameren corridor.

Pros

- Shortest Alignment
- Minimal impact to Property owners

Cons

- Higher cost than Alternative 4
- Adjacent to Ameren Substation
- Significant length of Tunnel adds to risk
- Potential for mixed faced tunneling over long distance further increases risk
- May require relocation of power pole
- Difficult to reconnect existing sewers

Alternative 2 – Tunnels under South Outer Forty Drive and Under I-64 and Clayton Road between first bent and second bent east I-64 bridge abutment and traverses between Heartland Bank and the new strip mall to the Ameren corridor.

Pros

- Minimal impact to Property owners

Cons

- Higher cost than Alternative 4
- Tunnel alignment under retaining wall
- Significant length of Tunnel adds to risk
- Potential for mixed faced tunneling over long distance further increases risk
- Difficult to reconnect existing lateral sewers

Alternative 3 – Tunnels under South Outer Forty Drive and Under I-64 and Clayton Road between the first and second bent from the east I-64 bridge abutment and traverses west of the new strip mall across the Deer Creek Tributary continues between #13 and #14 Foxboro Road along the Foxboro right-of-way to the Ameren Corridor.

Pros

- Shortest Alignment

Cons

- Highest cost
- Tunnel alignment under retaining wall
- Significant length of Tunnel adds to risk
- Potential for mixed faced tunneling over long distance further increases risk
- Difficult to reconnect existing lateral sewers
- Impact to properties on Foxboro (may require buyouts)

Alternative 4– Remains west of South Outer Forty Drive and tunnels Under I-64 and Clayton Road between the third and fourth bent east I-64 bridge abutment and traverses behind the house at #1300 Warson Road, crosses Deer Creek, and continues between #13 and #14 Foxboro Road along the Foxboro right-of-way to the Ameren Corridor.

Pros

- Least amount of construction risk due to shorter tunnel length
- Best alignment to reconnect existing lateral sewers
- Shortest tunnel length
- Least cost

Cons

- Longest Alignment
- Impact to properties on Warson and Foxboro (may require buyouts)

Alignment Recommendation

Sanitary Relief Trunk Sewer

As shown in Appendix A, the DC-02 and DC-03 alignment commences on the south side of the Deer Creek channel immediately east of the Two Mile Creek confluence. The alignment turns west along Two Mile Creek to Overbrook Drive. The Two Mile Creek lateral sewer will connect

to the new DC-02 and DC-03 sanitary relief sewer at Sta. 97+62, once Phase II is completed. Turning north along Overbrook Drive the sewer remains on the west side of the roadway outside of the existing road right of way. This location will require the acquisition of easements from the four lots on the west side of the roadway.

The alignment tunnels under Litzsinger Road and extends about 500 feet across mostly open fields owned by the Litzsinger Road Ecological Foundation prior to crossing of the Deer Creek channel. After crossing to the east side of the stream, the alignment continues in a northwesterly direction across a low lying overbank for a distance of about 1,200 feet. The alignment remains on the south side of Deer Creek in the lower lying flood plain to Log Cabin Lane where the ground surface elevations are generally 8 to 12 feet lower than on the opposite side of the creek. The alignment crosses the existing sewer at two locations (Sta. 154+13 and Sta. 156+48) within this reach. Connection to the existing sewer can be completed once Phase II construction is complete. Constructed SSO BP-349 on the existing trunk sewer can be removed after the connection to the existing sewer is complete.

Upstream of Log Cabin Lane the alignment runs along Tall Timbers Drive, a private cul-de-sac with its only entrance located on Log Cabin Lane. It has an entrance gate at Log Cabin Lane. West of Tall Timbers Drive the alignment parallels the South 40 Drive ROW on the south through the City of Ladue Property. At the Ladue Mulch Facility, the lateral sewer crossing the property from the south connects to the trunk sewer just west of the entrance to South 40 Drive, reducing disruption to the facility.

From the Mulch facility, the alignment remains west of South 40 Drive and crosses Deer Creek and tunnels Under I-64 and Clayton Road between the third and fourth bent east I-64 bridge abutment. The alignment traverses behind the house at #1300 Warson Road, crosses Deer Creek and continues between #13 and #14 Foxboro Road along the Foxboro right-of-way to the Ameren Corridor. The existing lateral sewers serving Springwood Drive and the Ladue Horton-Watkins high school are connected with a new lateral sewer tunneled under Warson Road and connected behind #14 Foxboro Road. The existing lateral sewer in Clayton Road will be rerouted to the north from Manhole 19M3-039S to connect to the trunk sewer. The existing 12-inch lateral sewer along Foxboro Road will be replaced with the trunk sewer. Upstream of Foxboro Road the 12-inch sewer will connect to the trunk sewer and allow the elimination of SSO BP-155.

The trunk sewer continues in a northwesterly direction in the Ameren corridor to a tunnel crossing of Warson Road. Several utilities are in the vicinity of the crossing, including a 30-inch water main. After crossing Warson Road, the sewer remains on the north side of the Ladue Horton-Watkins high school parking lot. At manhole 19M3-002S, the constructed trunk sewer will allow for the removal of the constructed SSO BP-170. The trunk sewer continues in a northwesterly direction to the constructed SSO BP-591 which will be removed. The upstream project limits are at Manhole 19M1-184S.

Lateral Sewers

As shown in Appendix A, there are several lateral sewers that need to be connected to the DC-02 and DC-03 Sanitary Relief Sewer. The locations and descriptions of each lateral sewer connection are as follows:

Sta. 97+62 - Two Mile Creek Lateral sewer extends from the connection in Overbrook Drive upstream to constructed SSO BP-348. The 48-inch sewer relieves the Two Mile Creek lateral and allows for the removal of SSO BP-348. The connection to the trunk sewer can be made and SSO BP-348 removed once Phase II construction is complete.

Sta. 120+35 is shown crossing the main channel of Deer Creek onto the Litzsinger Road Ecological Center's property to connect to an existing 8-inch diameter sewer. The connection can be made once the connection to the Phase II sewer is complete.

Sta. 144+39 – Connection to the existing sewer that wraps around the back of the lots in the Tall Timbers Subdivision to connect to three existing 8-inch diameter sewers. The sewer was shifted to the west slightly between the two existing houses.

Sta. 152+73 – Connect existing 8-inch sewer.

Sta. 185+66 – Realigned 8-inch sewer serving the subdivision on the south side of Deer Creek.

Sta. 191+81 – Realigned 8-inch sewer serving the subdivision on the south side of Deer Creek. Connection to Manhole 19M3-044S to provide service for the existing 12-inch lateral sewer in Clayton Road.

Sta. 196+60 – Connect to existing sewer on the east side of the Clayton/Warson Road under I-64 bridge.

Sta. 199+54 – Connect new lateral sewer designed to capture the flow from Springwood Subdivision and Briarwood Subdivision on the Ladue Horton-Watkins High School site. The Ladue Horton-Watkins High School service laterals are connected to this sewer and cannot be abandoned. This moves the existing sewer out of the creek channel and connects to the existing trunk that is to be rehabilitated and used in place.

Sta. 200+36 – Connects the existing 8-inch sewer from the west on Foxboro Road and replaces the existing 12-inch sewer upstream to Sta. 204+41.

Sta. 204+73 – Realigns the 12-inch sewer serving the sanitary sewer system north of Foxboro Subdivision. Connection of the 12-inch sewer allows the removal of SSO BP-155.

Sta. 225+74 – Realigns the connection of the existing 24-inch trunk sewer. Connection to this sewer allows the removal of SSO BP-170.

Sta. 229+59 – Realigns the connection of the existing 10-inch sewer serving the subdivision south of Deer Creek.

Sta. 231+04 – Connects to the existing 48-inch trunk sewer. Connection to this sewer allows the removal of SSO BP-591.

Impacts

Potential Utility Conflicts with Recommended Sewer Alignment

There are a number of utilities that are encountered along the recommended sewer alignment with some conflicts expected. The major ones are fiber optic lines, Ameren Missouri power poles, Laclede Gas lines and Missouri American water lines.

The potential for utility conflicts have been identified at three locations along the proposed alignment from Two Mile Creek to Log Cabin Lane based on available utility maps. The first location is when the alignment crosses and parallels Overbrook Drive. The available maps indicate that a 6" cast iron water line is located along the west side of the street and a 6" steel gas line is located along the east side of the street. The proposed alignment will cross Overbrook Drive and then turn north, parallel the street, approximately twenty feet west of the western edge of pavement. Significant utility conflicts are not anticipated due to the depth of the proposed sewer when it crosses the existing utilities and the proposed alignments offset when it parallels them.

The second location is when the alignment crosses Litzsinger Road. The available maps indicate that a 6" cast iron water line and an 8" steel gas line are located along the north side of the road. Aerial imaging indicates that overhead utilities are located along the south side of the road. It is anticipated that this section of the proposed alignment will be constructed by tunneling methods, therefore minimizing the potential for utility conflicts.

The third location is when the alignment crosses a private drive leading to 9809 Litzsinger Road. The available maps indicate that a 6" cast iron water line and a 1" gas line are located along the private drive. Significant utility conflicts are not anticipated due to the depth of the proposed sewer when it crosses these existing utilities.

Between Log Cabin Lane and the Ladue Mulch Site Entrance utility conflicts have been identified where the alignment crosses Log Cabin Lane and along Tall Timbers Drive. Utility maps indicate a 6" water line along the west side Log Cabin Lane. In addition there is a 2" gas and 6" water line that runs along the south edge of Tall Timbers Drive. Open cut construction is anticipated along this section. These utilities may need to be relocated due to depth of construction.

Table 4 indicates the Potential Utility Conflict locations by Station along the Recommended Sewer Alignment.

Table 4 – Potential Utility Conflict by Station

Potential Utility Conflicts for DC-02 & DC-03 (Stationing is as shown in Appendix A)		
Sta.	Sta.	Issue
107+01	107+23	Water and Gas line being crossed at Overbrook Drive
107+47	116+47	Water and Gas line being paralleled along Overbrook Drive
116+47	117+62	Water and Gas line and overhead utilities being crossed by tunnel under Litzsinger Road
139+92	140+05	Water and Gas line being crossed at a private drive
157+60	163+00	Paralleling multiple utilities in Tall Timbers Drive
195+47		Crossing of Overhead Electric
195+61	196+35	Multiple Utilities being crossed by Tunnel under I-64
200+97	203+35	Parallel Gas Main on Foxboro
204+41	213+19	Paralleling of Fiber Optic Line by New Sewer
197+69	200+69	Overhead Electric Paralleling New Sewer
213+19	213+79	Multiple Utilities being crossed by Tunnel under Warson Road
216+17		Overhead Electric Crossing New Sewer
218+74		Underground Electric to School
224+12		Overhead Electric Crossing New Sewer
224+74		Abutment Wing Wall

Conflicts with Existing Sewers

Existing lateral sewers may need to be connected to the DC-02 & DC-03 Sanitary Relief (Brentwood Blvd to Conway Rd) trunk sewer during construction and will require bypass pumping. The proposed sewer is deeper than the existing; however, it is also larger in diameter. Therefore, each potential crossing conflict was checked to determine the clearance as identified in Table 5 on the following page:

Table 5 – Crossing Clearances with Existing Sewers

Station	Upstream Structure	Downstream Structure	Clearance at Trunk	Comments
97+62	21L1-010S	21L2-001S	0.3'	Crosses Existing 30" VCP Trunk Sewer - Two Mile Creek
120+35	20L4-092S	20L4-091S	4.2'	Crosses Existing 8" PVC Lateral Sewer
144+39	20L1-043S	20L4-078S	-0.7'	Crosses Existing 8" VCP Lateral Sewer
152+73	20L1-032S	20L1-034S	4.6'	Crosses Existing 8" VCP (Lined) Lateral Sewer
154+13	20L1-031S	20L1-030S	3.1'	Crosses Existing 24" VCP Trunk Sewer
156+48	20L1-026S	20L1-076S	8.3'	Crosses Existing 24" RCP Trunk Sewer
157+50	20L1-029S	20L1-027S	5’	Crosses and parallels Existing 24” VCP Trunk Sewer
165+50	20L1-053D	20M2-032D	8’	Crosses Existing 48” RCP Storm Sewer
172+00	20M2-063S	20M2-043S	0.1’	Crosses Existing 18” VCP (CPP) Lateral Sewer
196+60	19M3-091S	19M3-038S	6.5	Crosses Existing 12" VCP Lateral Sewer
198+81	20L1-026S	20L1-025S	6.1'	Crosses Existing 21" VCP Trunk Sewer
199+23	19M3-043S	19M3-044S	3.7'	Crosses Existing 24" RCP Trunk Sewer
204+73	19M3-047S	19M3-046S	13'	Crosses Existing 12" VCP Lateral Sewer
225+40	19M2-106S	19M3-002S	0.3'	Crosses Existing 24" PVC Trunk Sewer

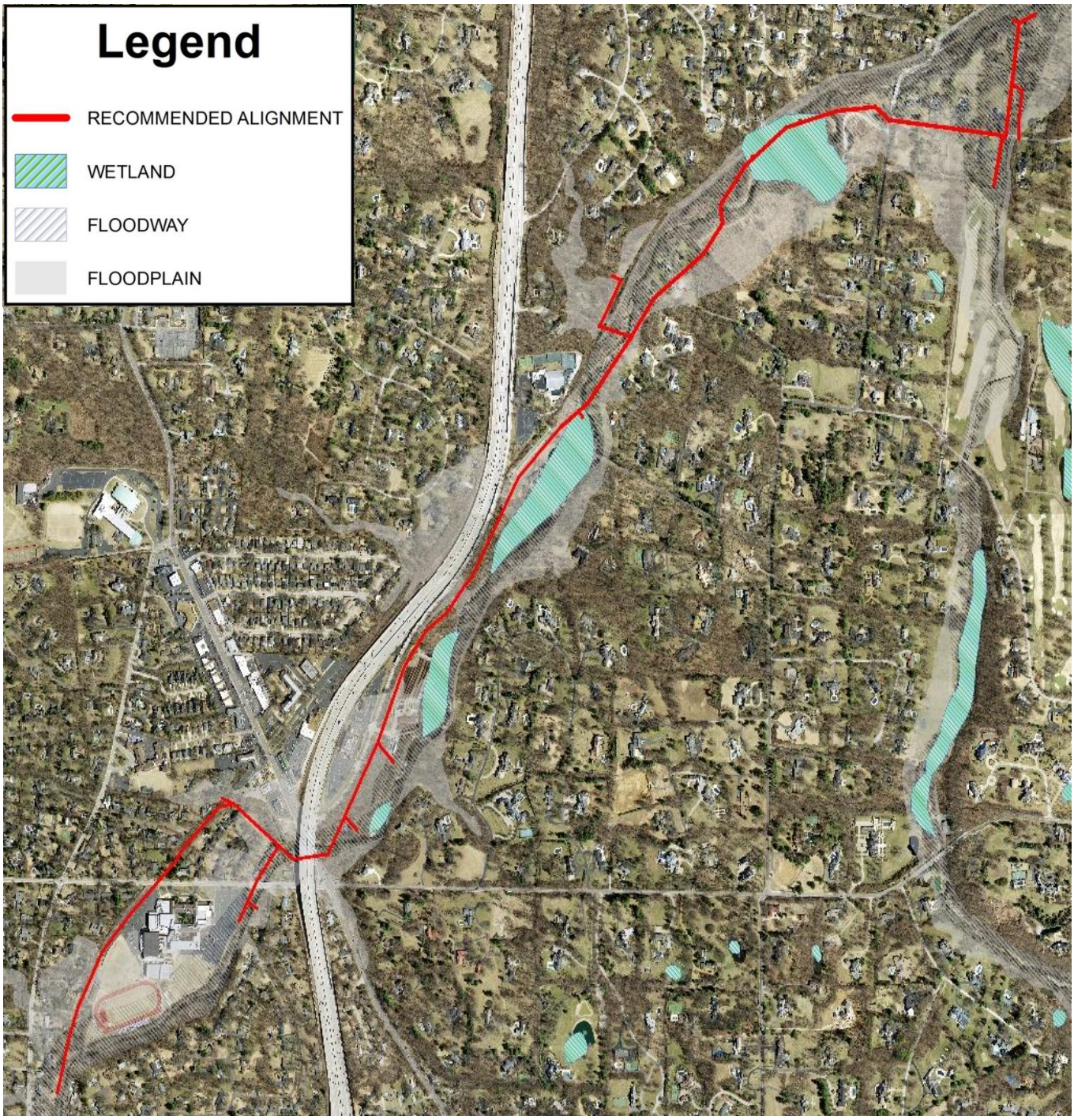
Floodplain and Wetlands Impacts

The majority of the recommended alignment follows Deer Creek. Significant portions of the proposed sanitary relief sewer will be constructed within the Floodplain/Floodway. Manhole structures within the Floodway/Floodplain should be constructed with lid and frame seals to prevent floodwaters from inundating the sanitary sewer system during high water. Floodplain information is shown in Figures 1 & 4 and areas of concern are highlighted below:

- Two Mile Creek to Log Cabin Drive – Entirely within the Floodway
- Log Cabin Drive to Tall Timbers Drive – Entirely within the Floodplain
- Ladue Mulch Site through Foxboro Subdivision – Entirely within the Floodway or Floodplain.
- Behind Ladue High School to Upstream Limits of the Project - Entirely within the Floodway or Floodplain.

Three wetlands have been identified in the National Wetland Inventory maintained by the United States Fish and Wildlife Service. The mapped wetlands are delineated in Figures 1 & 4. The recommended alignment avoids the mapped wetlands with two exceptions. A significant portion of the alignment on the Ecology Center property traverses a large wetland. It is unlikely this wetland can be avoided and mitigation will be required, however, mitigation can likely be handled onsite as part of the project. The second location is east of Log Cabin Drive. The alignment in this location only clips the edge of the wetland. During design, further delineation and alignment adjustments may allow this wetland to be avoided. If the wetland cannot be avoided, impacts are expected to be minor.

Figure 4 – Alignment Alternatives (Ladue Mulch Site Entrance to Ladue Horton-Watkins High School)



Impacts to Continuing Service to Existing Customers

There should be no impacts to existing service as lateral sewers will be connected once the new sanitary relief sewer is constructed and placed in service. Bypass pumping will be required at nearly all of the lateral connections and whenever the new sanitary relief sewer is in the approximate same alignment as the existing Deer Creek trunk sanitary sewer.

Constructability Evaluation and Potential Tunnel Locations

Between Two Mile Creek and Log Cabin Lane the construction corridor is fairly wide open and unobstructed. With the exception of the roughly 1,200 feet between the two stream crossings in the middle of the alignment, the construction corridor lies above the Deer Creek 5-year flood profile. The four stream crossings are the only areas where significant constructability issues may be encountered. The only potential tunnel location in this section is at the Litzsinger Road crossing.

Between Log Cabin Lane and the Ladue Mulch Site, the biggest constructability issue will be construction along Tall Timbers Drive and maintaining access to residences. There is also a minor creek crossing by the recommended alignment at Sta. 172+00. There may also be a creek crossing for a lateral sewer. This will be evaluated further in detailed design. Potential tunneling locations have not been identified along this section.

From the City of Ladue Mulch Site upstream to the end of the project, the corridor transitions from an open wooded area to a dense urban environment. Tunnel construction will be required under the 1-64/Clayton Road intersection and at the Warson Road crossing. Significant impacts will be expected to the properties at 1300 Warson Road, and 8, 12-14 Foxboro Road. These properties are within the floodplain, and 14 Foxboro Road is within the floodway. Consideration should be given to purchasing the properties. After traversing the Foxboro Subdivision, the alignment enters the Ameren corridor. The corridor itself is relatively free of surface improvements, but does contain numerous underground utilities. After tunneling under Warson Road, the sewer crosses the Ladue Horton-Watkins High School parking lot, which will require additional coordination with the school district and likely construction restrictions during school hours. Connection of the lateral sewer serving the high school and Springwood Subdivision will require tunneling under Warson Road.

As indicated in the Recommended Alignment Plan and Profile drawings in Appendix A, rock is anticipated to be encountered the entire length of the Recommended Alignment and will have to be excavated by either blasting or chipping with a Hoe Ram.

Additional Recommended Soil Boring Locations

It is anticipated that the recommended alignment will require 16 new soil borings. The location of these borings will be very close in proximity to those proposed in Shannon & Wilson, Inc. proposal dated May 20, 2015 and as indicated in Figures 5 and 6. There are no additional recommended soil borings between Log Cabin Lane and the Ladue Mulch Facility.

FIGURE 5
APPROXIMATE LOCATION OF ANTICIPATED ADDITIONAL BORINGS FOR DC-02 DC-03 PHASE III
Rev. 1

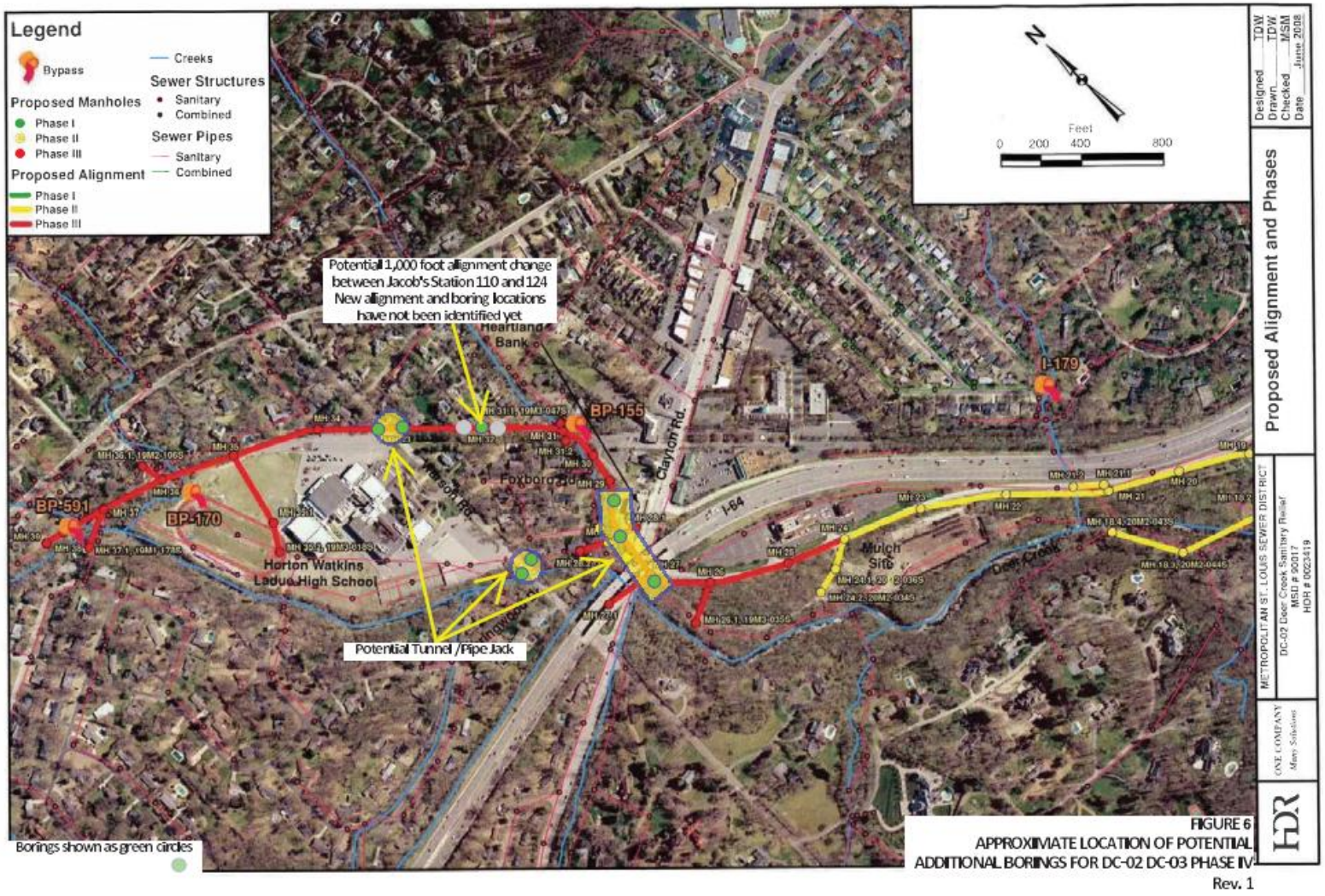


FIGURE 6
APPROXIMATE LOCATION OF POTENTIAL ADDITIONAL BORINGS FOR DC-02 DC-03 PHASE IV
Rev. 1

Easement Requirements

A significant number of permanent and temporary construction easements will be required for this project. Nearly all of the recommended alignment will be constructed in new permanent easements. Existing permanent easements will be used when feasible; mostly for the purposes of connecting lateral sewers to the new trunk line. Our review of the available property information indicates that construction of the recommended alignment will require the acquisition of permanent easements on approximately 36 properties. In addition, temporary construction easements will be required on many of these same properties, as well as on other properties along the alignment. Upstream of Log Cabin Lane much of the recommended alignment lies on property owned by either the City of Ladue, Ameren, or the Ladue School District.

Preliminary Opinion of Probable Construction Cost

The Preliminary Opinion of Probable Construction Cost for the Recommended Alignment is indicated in Table 6. List prices are based on the November 23, 2015 version of the CIPRO bid tab data base. Override prices are adjustments made to the list prices based on the DC02/03 Sanitary Relief Phase 1 Bid results.

Table 6 – Recommended Alignment Preliminary Opinion of Probable Construction Cost

Category	Item	Item Description	Unit	List Price	Override Price	Quantity	Cost
997.09	9F100000000000	ABANDONMENT - PIPE FILL	CY	$ 425.00		1005	$427,125
997.09	9F200000000000	ABANDONMENT - STRUCTURE	EA	$ 1,010.00		32	$32,320
997.04	4I6c1048000000	BOTTOM SECT. OF MANHOLE-48 INCH PIPE	EA	$ 6,100.00		31	$189,100
997.04	4I6c2054000000	BOTTOM SECT. OF MANHOLE-54 INCH PIPE	EA	$ 6,500.00		16	$104,000
997.04	4I6c2066000000	BOTTOM SECT. OF MANHOLE-66 INCH PIPE	EA	$ 8,000.00		2	$16,000
997.03	3D1g0000BYPUMPX	BYPASS PUMPING	LS	$ 1.00		87150	$87,150
997.03	3H100000000000	CLEARING	LS	$ 15,000.00		6	$94,638
997.09	9D6C0000DRIVACX	DRIVEWAYS-ASPHALTIC CONCRETE	SY	$ 65.00		1500	$97,500
997.04	4I200008DIP052	DUCTILE IRON PIPE SEWER 08 INCH CLASS 52	LF	$ 165.00	$ 200.00	331	$66,200
997.04	4I200018DIP052	DUCTILE IRON PIPE SEWER 18 INCH CLASS 52	LF	$ 350.00		227	$79,450
997.04	4I200024DIP052	DUCTILE IRON PIPE SEWER 24 INCH CLASS 52	LF	$ 390.00		265	$103,350
997.04	4I200048DIP052	DUCTILE IRON PIPE SEWER 48 INCH	LF	$ 350.00	$ 450.00	8424	$3,790,800
997.04	4I200054DIP052	DUCTILE IRON PIPE SEWER 54 INCH CLASS 52	LF	$ 360.00	$ 485.00	3935	$1,908,475
997.03	3H5000000000ADX	EXCAVATION CLASS "A" (DEEP SEWER)	CY	$ 400.00		26387	$10,554,926
997.07	7O2b0000000000	EXCAVATION CLASS "A" IN TUNNEL	CY	$ 85.00		607	$51,629
997.03	3H50000000000B	EXCAVATION CLASS "B"	CY	$ 55.00		1635	$89,925
997.03	3H5000000000BDX	EXCAVATION CLASS "B" (DEEP SEWER)	CY	$ 95.00		4875	$463,167
997.03	3H50000000000C	EXCAVATION CLASS "C"	CY	$ 28.00		1644	$46,032
997.03	3H5000000000CDX	EXCAVATION CLASS "C" (DEEP SEWER)	CY	$ 35.00		40754	$1,426,385
997.04	4I6d0008000000	FOULWATER DROP - 08 INCH PIPE	EA	$ 1,700.00	$ 2,160.00	6	$12,960
997.04	4I130000000000	GRANULAR BACKFILL	CY	$ 55.00		4819	$265,045
997.04	4I100000000JCL	JUNCTION CHAMBER - REINFORCED CONCRETE - LARGE	EA	$ 90,000.00	$ 350,000.00	5	$1,750,000
997.04	4I600000000000	MANHOLE - STANDARD CONSTRUCTION	LF	$ 335.00	$ 385.00	1309	$503,965
997.04	4I600000COVERSX	MANHOLE COVER SEALS	EA	$ 375.00		71	$26,625
997.04	4I600000FRAMESX	MANHOLE FRAME SEALS	EA	$ 975.00		71	$69,225
997.01	1G6a0000000MOBX	MOBILIZATION	LS	$ 1.00		0	$1,142,685
997.07	7O200012000000X	PIPE IN TUNNEL 12 INCH	LF	1315		100	$131,500
997.07	7O200018000000X	PIPE IN TUNNEL 18 INCH	LF	$ 950.00		100	$95,000
997.07	7O200048000000X	PIPE IN TUNNEL 48 INCH	LF	$ 2,000.00	$ 4,500.00	480	$2,160,000
997.07	7O200054000000X	PIPE IN TUNNEL 54 INCH	LF	$ 2,080.00	$ 5,000.00	100	$500,000
997.04	4I2000080000SC	PIPE SEWER 08 INCH (SANITARY/COMBINED)	LF	$ 120.00	$ 150.00	1361	$204,150
997.04	4I2000120000SC	PIPE SEWER 12 INCH (SANITARY/COMBINED)	LF	110		108	$11,880
997.04	4I2000180000SC	PIPE SEWER 18 INCH (SANITARY/COMBINED)	LF	$ 155.00	$ 200.00	1323	$264,600
997.04	4I2000210000SC	PIPE SEWER 21 INCH (SANITARY/COMBINED)	LF	165		854	$140,910
997.04	4I2000240000SC	PIPE SEWER 24 INCH (SANITARY/COMBINED)	LF	$ 175.00	$ 250.00	458	$114,500
997.04	4I2000720000SC.1	PIPE SEWER 66 INCH (SANITARY/COMBINED)	LF	$ 450.00	$ 910.00	1024	$931,840
997.08	8H000000000000	PROTECTION AND RESTORATION OF SITE	LS	$ 1.00		0	$4,285,069
997.06	6J4000000000RB	ROCK BLANKET	SY	$ 80.00		8789	$703,129
997.08	8H500000000000	SEEDING	SY	$ 2.50		24651	$61,628
997.08	8H4000000000BG	SODDING - BLUEGRASS	SY	$ 13.00		11447	$148,811
997.09	9D400000000000	STREET PAVEMENT - ASPHALTIC CONCRETE REM. AND REP.	SY	$ 85.00		3633	$308,805
997.09	9D5b0000000000	STREET PAVEMENT - CONCRETE REM. AND REP.	SY	$ 80.00		1111	$88,880
		UTILITY RELOCATION					$ 445,500
				Sub Total			**$33,994,878**
				Contingencies (20%)			**$6,798,976**
				Total			**$40,793,854**

Table 7 compares the differences between the HDR Recommended Alignment capital costs and major cost items listed as HDR (FY2016 $) with the Parsons Alignment Recommendations costs dated July 1, 2015 listed as Parsons (FY2015 $). Parsons (FY2016 $) updates the Parsons (FY2015 $) costs based on the November 23, 2015 CIPRO bid tab database with override cost adjustments for comparison with the HDR (FY2016 $) costs. The Parsons estimate assumed that the majority of the Phase III alignment would be tunneled.

Table 7 – Recommended Alignment Major Cost Item Comparison

Major Cost Item	HDR (FY2016 $)	Parsons (FY2015 $)	Parsons (FY2016 $)	Difference	Comment
Abandonment Cost	$ 459,445	$ -	$ -	$ 459,445	Not included in Parsons Estimate
Excavation Cost	$ 12,632,064	$ 4,830,515	$ 5,698,819	$ 6,933,245	Parsons does not utilize Deep Sewer Excavation Costs. HDR excavation quantity higher due to shorter tunnel length.
Pipe Costs	$ 7,616,155	$ 1,547,025	$ 1,787,265	$ 5,828,890	Overall pipe length increased in HDR alignment.
Pipe in Tunnel Cost	$ 2,886,500	$ 8,792,875	$ 27,929,435	$ (25,042,935)	Parsons used the Tunnel unit price for 5,000 ft. of trunk sewer pipe.
Structure Cost	$ 2,746,065	$ 843,775	$ 2,495,920	$ 2,511,420	Unit Prices are higher across the board on the HDR estimate.
Miscellaneous Cost	$ 2,226,896	$ 1,474,326	$ 652,400	$ 1,574,496	Unit Prices are higher across the board on the HDR estimate.
Sub-Total	***$ 28,567,125***	***$ 17,488,516***	***$ 38,579,339***	***$ 11,078,609***	
				$ -	
Mobilization	$ 1,142,685	$ 569,621	$ 1,543,174	$ 573,064	
Protection and Restoratio	$ 4,285,069	$ 2,136,080	$ 5,786,901	$ 2,148,989	
Contingencies (@20%)	$ 6,798,976	$ 4,038,843	$ 9,181,883	$ 2,760,132	
Construction Cost Total	**$ 40,793,854**	**$ 24,233,060**	**$ 55,091,296**	**$ 16,560,794**	

Construction Phasing

Figure 7 identifies the originally planned four construction phases and schedules by year for construction of the DC-02 and DC-03 Sanitary Relief Sewer in order to eliminate the constructed SSOs (BP-155, BP-170, BP-198, BP-348, BP-349, BP-545, and BP-591) by the Consent Decree mandated milestone date of December 31, 2023.

Figure 7 – DC-02 and DC-03 Sanitary Relief Sewer Phases and Schedules by Year

The current detailed schedules for Phases I and II are as indicated in Table 7.

Table 7 – DC-02 & CD-03 Sanitary Relief Sewer Schedule, Phases I and II

DATE: 12/16/2015

LEAD FIRM (IF APPLICABLE)	PARSONS				PARSONS			
PROJECT NAME	DC-02 & DC-03 Sanitary Relief (Brentwood Blvd to Conway Rd)				DC-02 & DC-03 Sanitary Relief (Brentwood Blvd to Conway Rd)			
PROJECT NUMBER	10021				12471			
CONSTRUCTED SSO NO. (# OR N/A)	BP-155,BP-170,BP-198,BP-348,BP-349,BP-545,BP591				BP-155,BP-170,BP-198,BP-348,BP-349,BP-545,BP591			
CONTRACT STAGE - DASHBOARD	**CONTRACT**	**PLANNED**	**ACTUAL**	**SSOMP**	**CONTRACT**	**PLANNED**	**ACTUAL**	**SSOMP**
CONSULTANT NEGOTIATION COMMENCE								
CONSULTANT NEGOTIATION COMPLETE								
PREDESIGN REPORT / PRELIMINARY STUDY								
ALTERNATIVES								
DRAFT								
FINAL								
FINAL DESIGN								
INITIAL DESIGN / PRELIM CONFERENCE / KICKOFF MEETING **	10/29/12	10/29/12	10/29/12	**4/2/13**	10/29/12	10/29/12	10/29/12	**4/2/13**
FACILITY DESIGN (TANK, TUNNEL, OR PUMPSTATION)								
DATA REVIEW / SUBMITTAL / WORKSHOP								
CONCEPT DESIGN / SUBMITTAL MEETING								
30% DESIGN SUBMITTAL/WORKSHOP								
60% DESIGN SUBMITTAL/WORKSHOP	6/20/14	6/20/14	6/20/14		11/18/14	11/18/14	11/18/14	
90% DESIGN SUBMITTAL/WORKSHOP	10/3/14	10/3/14	10/3/14		8/10//15	8/10/15	8/10/15	
MSD REVIEW	11/10/14	11/10/14	3/24/15		8/31/15	8/31/15	9/3/15	
PRIVATE I/I REDUCTION								
DATA REVIEW AND FIELD EVALUATIONS								
NEGOTIATIONS								
PRIVATE I/I CONSTRUCTION DOCUMENTS AND PIR REPORT»								
SEWER DESIGN								
DESIGN STUDY / ALIGNMENT TM	3/18/13	3/18/13	3/18/13		3/18/13	3/18/13	3/18/13	
MSD REVIEW	4/22/13	4/22/13	4/22/13		4/22/13	4/22/13	4/22/13	
SURVEY								
FIRST PLAN SUBMITTAL								
MSD REVIEW								
DESIGN COMPLETION »						10/5/15	10/5/15	
PUBLIC I/I REDUCTION								
DATA REVIEW								
DESIGN COMPLETION								
MSD REVIEW »								
ROW / EASEMENT ACQUISITION	IMP SCH				IMP SCH			
NUMBER OF EASEMENTS			17			26	27	
COMMENCE (START)	12/8/14	5/15/14	8/21/14		8/10/15	8/10/15		
COMPLETE (FINISH)	3/8/16	8/21/15			8/10/16	8/10/16		
PROJECT DELAY								
DELAY (MONTHS)								
BIDDING		FY-17				FY-17		
FINAL DOCUMENTS	5/8/16	10/1/15	10/15/15		9/10/16	**9/10/17**		
ADVERTISEMENT	6/8/16	10/10/15	10/21/15		10/10/16	**10/10/17**		
BID OPENING	7/15/16	12/10/15			11/9/16	**11/9/17**		
BOARD INTRODUCTION	8/11/16	1/14/16			12/9/16	**12/14/17**		
BOARD ADOPTION	9/8/16	2/11/16			1/8/17	**1/11/18**		
CONSTRUCTION PHASE								
COMMENCE CONSTRUCTION (START) **	9/8/16	2/12/16		3/7/18	1/9/17	**1/12/18**		
COMPLETE CONSTRUCTION (FINISH) **	6/30/21	1/11/18		5/10/23	11/9/18	**11/12/20**		
POST MONITORING COMMENCE (START)	6/30/21				11/9/18			
POST MONITORING COMPLETE (FINISH)	6/30/22				11/9/19			
CONSTRUCTED SSO REMOVAL	6/30/22							
PLACEMENT IN SERVICE **	6/30/22	1/11/18		9/7/23	12/9/19	**12/12/20**		9/7/23

DASHBOARD	
	On schedule, no issues
	Up to 30 days
	More than 30 days
	Candidate to move up
BOLD	Amended contract

** - Dates Reported to EPA

SSOMP - Master Plan Schedule

As can be seen from the current schedules, Phase II construction completion and placement in service are scheduled to be completed on 11/12/20 and 12/12/20 respectively. This means that Phase III construction either has to start at the end of 2020 or start prior to completion of Phase II in order to provide enough schedule float for easement acquisition, bidding and award, and construction and placement in service for Phases III and IV in order to meet the mandated Consent Decree milestone (12/31/2023) for elimination of the constructed CSO's.

As can be seen from the combined Phases III and IV Schedule in Table 1, there is currently approximately one year of schedule float in the Phase III and IV schedule if bid together and construction starts (6/1/2019) before Phase II is complete and operational. If the sanitary relief sewer construction is delayed until Phase II is placed in service, approximately 6 months of that schedule float would be lost. Any delay in acquiring the necessary Phase III and IV easements, or successfully awarding the project to a responsible bidder, could also impact the available schedule float, whether constructed as scheduled in Table 1, or when Phase II is placed in service. Bidding and constructing two separate construction contracts (Phase III and Phase IV) could further complicate the bid, award, and start of construction of the DC-02 and DC-03 Sanitary Relief Sewer and increase the potential risk of not meeting the mandated Consent Decree schedule. Pros and Cons of constructing Phases III and IV together and separately include the following:

Bid and Construct Phases III and IV together

Pros

- One Bid and Award
- Construction Management for a single Phase III/IV Construction Contract and Construction Contractor
- Communication and coordination of work with the Phase II Construction Contractor only
- Continuity and consistency in Construction means and methods

Cons

- Potential Bonding Capacity issues for qualified Contractors due to Construction Contact amount
- Size of the Construction Contract may limit the number of potential Bidders.

Bid and Construct Phases III and IV separately

Pros

- Flexibility to construct both phases separately
- Construction schedule could be reduced by starting both phases separately or concurrently
- Smaller Construction Contract amount could increase qualified bidders and competition

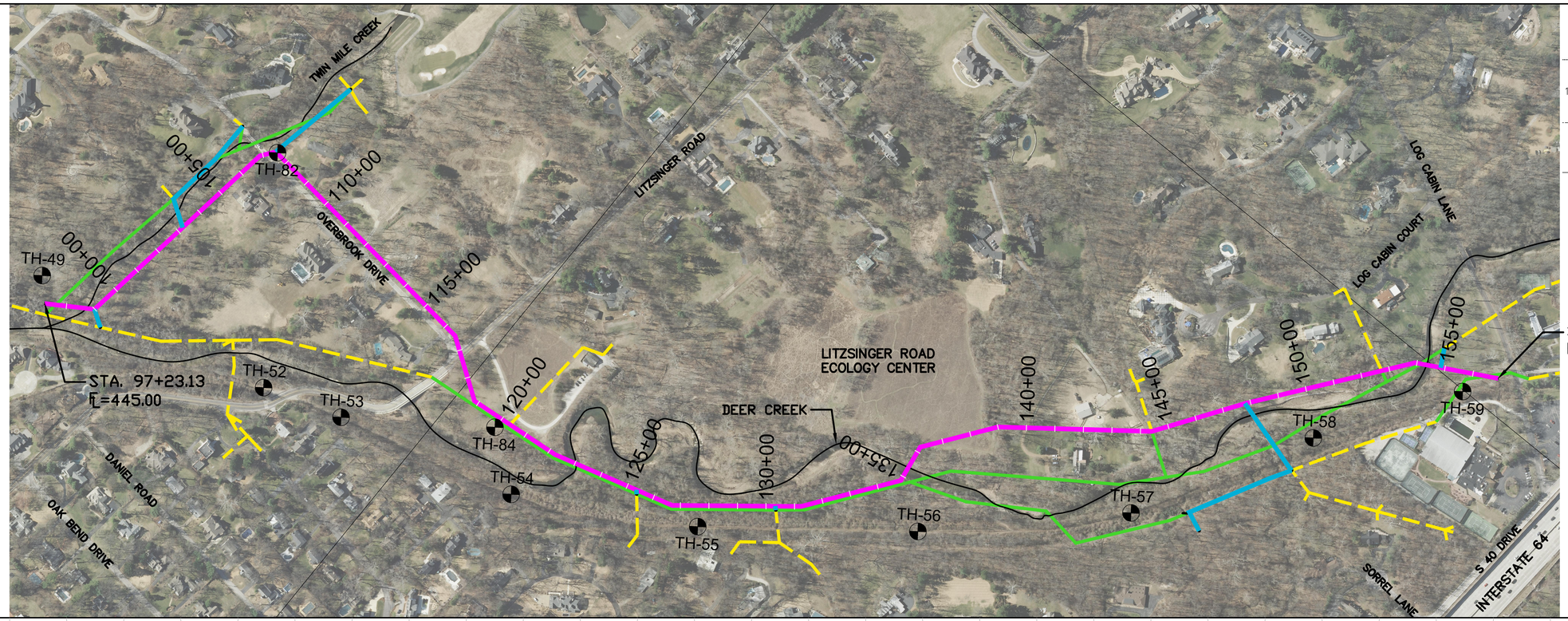
Cons

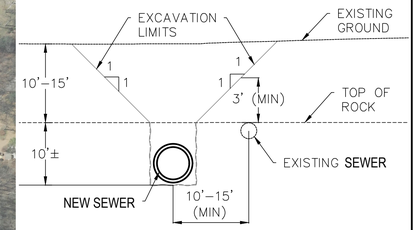
- Administration burden and scheduling of two separate Bid/Awards and Construction Contracts

- Communication and coordination of work between three separate Contractors (Phases II, III and IV)
- Construction Management for two separate Construction Contracts and Contractors
- Potential differences in Construction means and methods
- Potential horizontal and vertical alignment conflicts if constructed in two phases

Based on the currently identified approximate one year of schedule float to construct Phases III and IV as a single bid and Construction Contract, and the pros and cons previously identified, it is recommended that Phases III and IV be combined and designed, bid and constructed as if they were a single Phase.

Appendix A – Recommended Alignment Plan and Profile



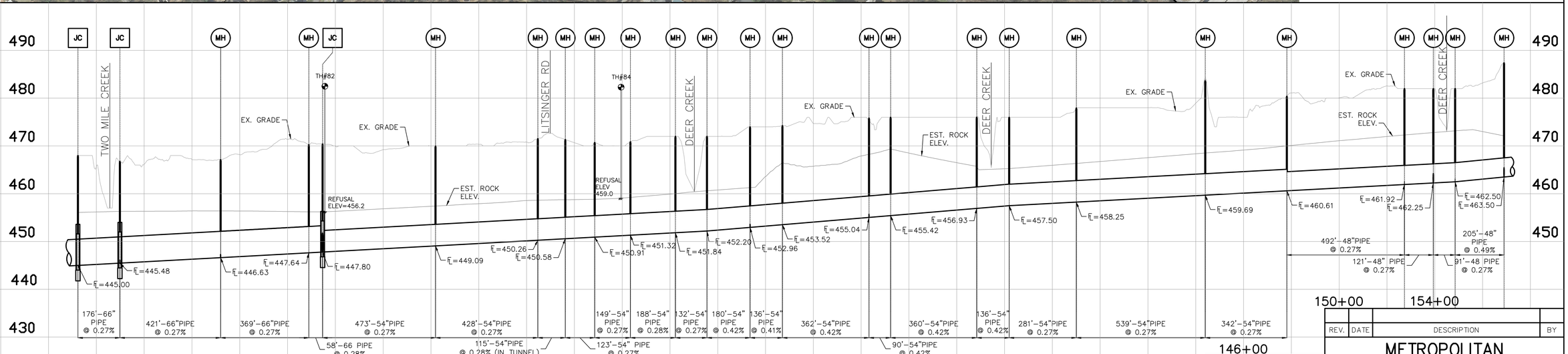


PARALLEL SEWER INSTALLATION

SCALE: 1"=200'

LEGEND

- TRUNK ALIGNMENT
- CONNECTOR
- TO BE ABANDONED
- EXISTING SANITARY



SCALE: 1"=200' HORZ.
1"= 10' VERT.

CL "A" STA. 98+00 102+00 106+00 110+00 114+00 118+00 122+00 126+00 130+00 134+00

EDSI
ENGINEERING DESIGN SOURCE, INC.
16141 SWINGLEY RIDGE RD., SUITE 300
CHESTERFIELD, MO 63017 (636) 537-5585
Engineering / Land Surveying
001523 / 2002030547

Engineer Seal

ANDREW M. ANDONOFF, P.E.
PROFESSIONAL ENGINEER
P.E. No. E-14940
Date: 12/04/2015

REV.	DATE	DESCRIPTION	BY

METROPOLITAN ST. LOUIS SEWER DISTRICT

DC-02 & DC-03 SANITARY RELIEF (BRENTWOOD BLVD TO CONWAY RD)
12472-015.1
PHASE III & IV
CITY OF LADUE, MISSOURI

Designed ____ Date DEC, 2015
Drawn ____
Checked ____

PRELIMINARY

Sheet No 1 of 3

BASE MAP: 19M, 20L, 20M, 21L

EDSI_Proposed

Path: N:\E14033.02 HDR - DC02-DC03 Sanitary Relief\drawings\output\2015-12-15_Plan&Pro\
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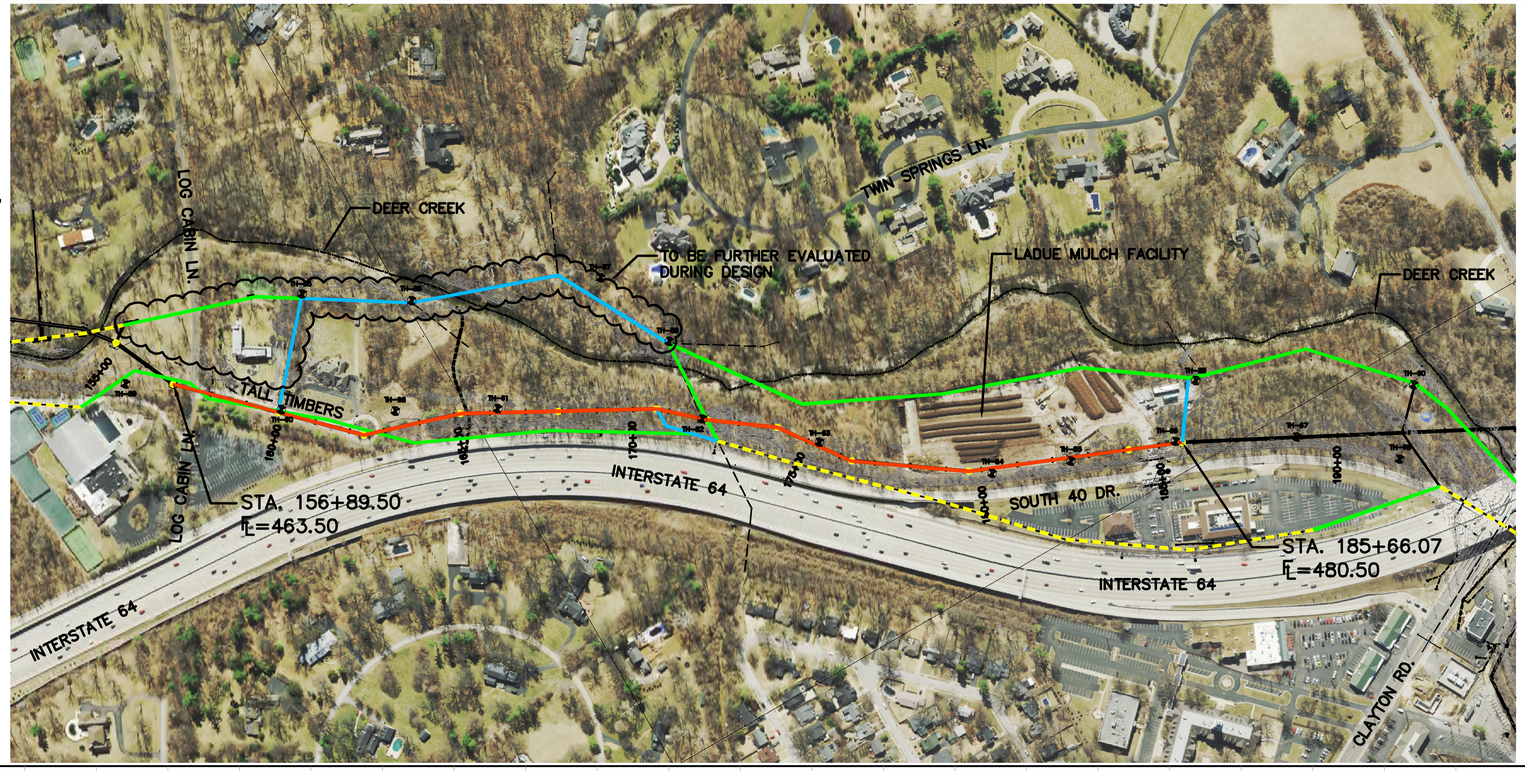
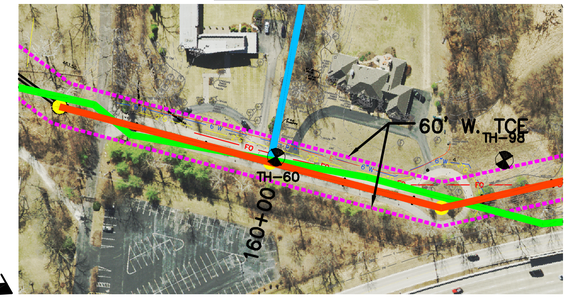


LEGEND

- TRUNK ALIGNMENT
- CONNECTOR
- TO BE ABANDONED
- EXISTING SANITARY

ALTERNATIVE 1



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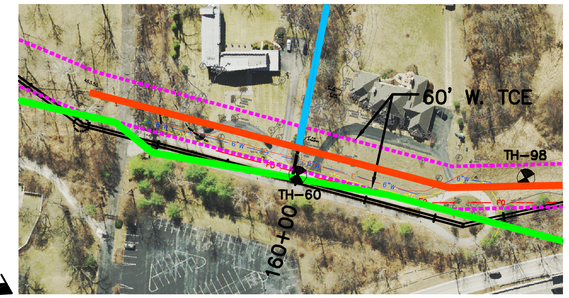

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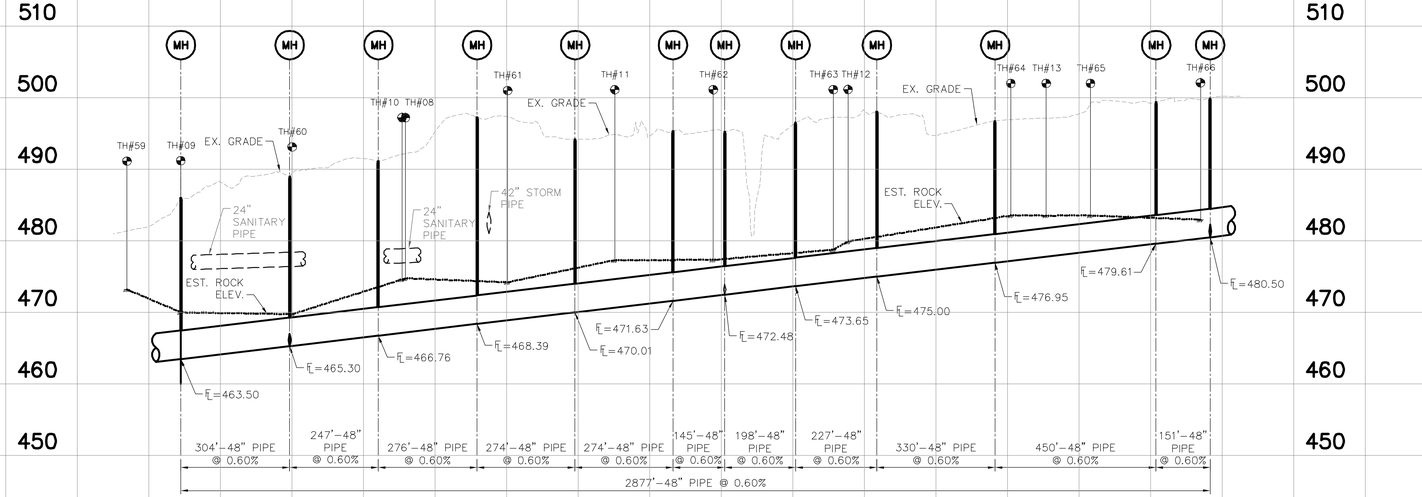

SCALE: 1"=200' HORZ.
1"= 10' VERT.

HDR Engineering, Inc.
401 S. 18th St., Suite 300
St. Louis, Missouri 63103
(314) 425-8300
ENGINEERING LICENSE NO. 000856

Engineer Seal

Date:
Name: Robert J. Kuenzel
Discipline: Civil Engineer
License No: PE-2008002180

REV.	DATE	DESCRIPTION	BY

METROPOLITAN ST. LOUIS SEWER DISTRICT

DC-02 & DC-03 SANITARY RELIEF
(BRENTWOOD BLVD TO CONWAY RD)
12472-015.1
PHASE III & IV
CITY OF LADUE, MISSOURI

Designed R.K.
Drawn R.K.F.
Checked
Date DEC. 2015
Sheet No 2 of 3

PRELIMINARY

Path: C:\pwworking\ama\d2028768\
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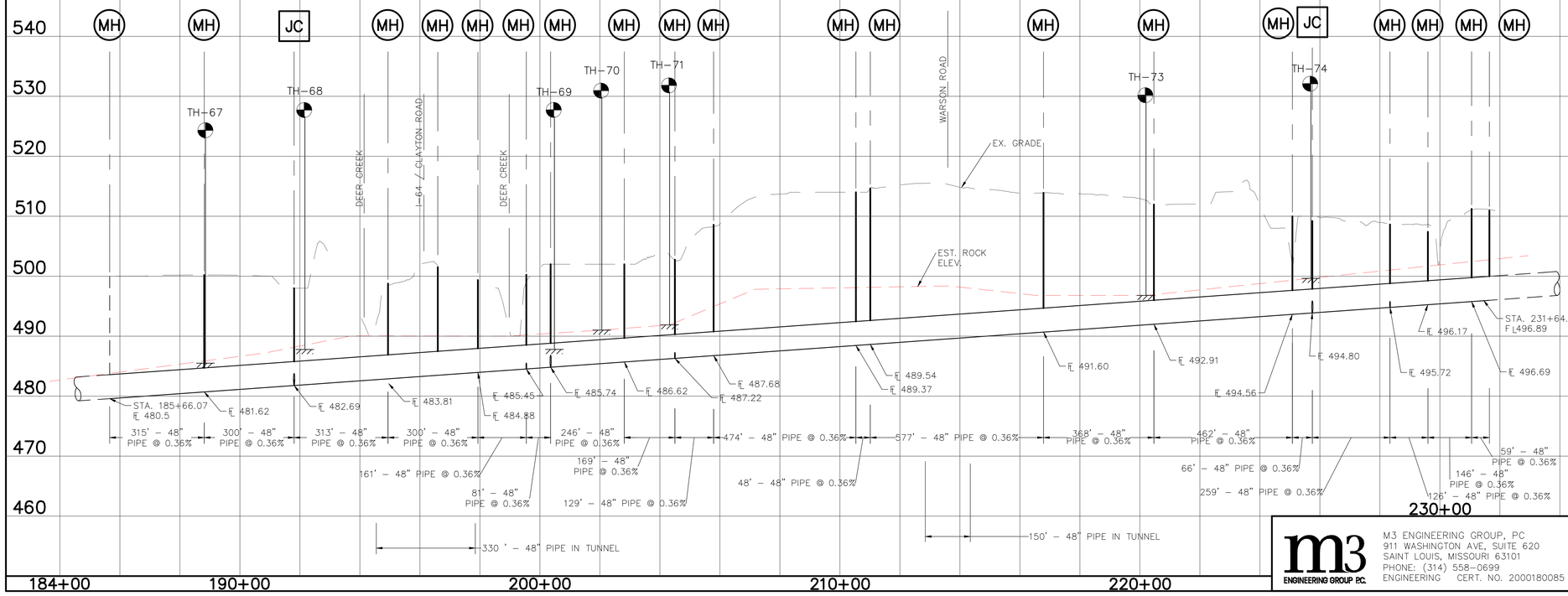
BASE MAP: 19M, 20L, 20M, 21L 12472-IV P&P HDR

1"=200'

LEGEND

- TRUNK ALIGNMENT
- CONNECTOR
- TO BE ABANDONED
- EXISTING SANITARY



SCALE: 1"=200' HORZ.
1"= 10' VERT.

REV.	DATE	DESCRIPTION	BY

METROPOLITAN ST. LOUIS SEWER DISTRICT

DC-02 & DC-03 SANITARY RELIEF (BRENTWOOD BLVD TO CONWAY RD)
12472-015.1
PHASE III & IV
LADUE, MISSOURI

Engineer Seal

Date:
Name: TODD D. WILLIAMS
Discipline: Civil Engineer
License No: E-2000150085

M3 ENGINEERING GROUP, PC
911 WASHINGTON AVE, SUITE 620
SAINT LOUIS, MISSOURI 63101
PHONE: (314) 558-0699
ENGINEERING CERT. NO. 2000180085

Designed M.K.W.
Drawn M.K.W.
Checked
Date DEC. 2015
Sheet No 3 of 3

PRELIMINARY

12/23/2015

BASE MAP: 19M, 20L, 20M, 21L

Path: C:\0_Clients\HDR\RDP Tribs\DC0203\CAD\
Plotted on: 12/23/15 @ 02:32:24PM by Todd.Williams

Appendix B – Preliminary Conference Field Visit Meeting Notes

Field Visit Notes

Project: DC-02 & DC-03 Sanitary Relief (Brentwood Blvd. to Conway Rd.) Ph. III & IV – 12472 - Design

Subject: Walk of Alignment and Necessary Modifications

Attendees:

Jerry Jung – MSD
Jim Dunajcik – MSD
Dan Nichols – MSD
Jeff Smith – MSD
Mike Stewart – MSD
Doug Hickey – HDR
Darcy Riegel - HDR
Rob Kuenzel - HDR
Todd Williams – M3
Samantha Weidenbenner – M3
Jason Melton – M3
Denny Welker – EDSI
Kevin Nelson – B&V

Date: Friday, September 11, 2015

1. General
    a. Parsons is preparing a SSO Removal Memo for DC-02 & DC-03 that will provide direction on whether the various phases can be constructed "in the wet" or "dry" only. Estimated completion is the end of October.
    b. The District is no longer using the "Green Book" front ends for larger projects using third party CM. EJCDC/CSI format project specifications are being required. Division 1 and 2 specifications from projects being bid in the near future may be used as guides for this project.
    c. Need to meet with the Ecology Center and Ladue High School to discuss alignment options in these areas.
2. Two Mile Creek (end of Phase II) to Log Cabin Lane (EDSI design segment)
    a. BP-349 on Two Mile Creek can be eliminated by a Ph. III alignment to the north or south side of the Creek.
    b. Regardless of which alignment is selected, behind the homes on Overbrook Dr. or in Overbrook Dr. itself, we have to provide sewer service to the existing homes. This applies throughout the project as well.
    c. Restrict the Contractor from using the bridge over Two Mile Creek on Overbrook Dr. The bridge has a 10 Ton limit. Contractor access from Litzsinger Road only.
    d. Operations would prefer the alignment in Overbrook Dr. The sewer in the rear could possibly be lined and remain in service for the homes currently connected to it.
    e. The Alternate alignment crossing of Litzsinger Rd. will most likely have to be tunneled due to the traffic impact and close proximity to the bridge and roadway curve.
    f. The City of Ladue would like the Alternate alignment to the north of the existing sanitary trunk sewer and east of the Tennis Club since they would like to turn it into a greenway/walking/bike path.
3. Log Cabin Lane to Ladue Mulch Facility (HDR design segment)
    a. Don't take out the trees on Tall Timbers Dr. that screen the I-64 Highway since they provide a visual and sound barrier to the residents.

   b. The City of Ladue would like the sanitary lateral sewer alignment revised as shown on Sheet 7 of the Alignment Recommendations TM to avoid crossing over the entrance to the Much Facility of South Forty Dr. and potentially disruption operations at the facility.

4. Ladue Mulch Facility to Conway Road (M3 design segment)
   a. A potential Alignment revision to avoid the new building constructed next to the Heartland Bank on Clayton Rd. would be to tunnel from South Forty Drive to a location near the southeast corner of the Heartland Bank. Another potential alignment would be to tunnel from South Forty Dr. to Foxboro Road.
   b. There is a gated private drive off of the Ladue High School drive and parking area that is the only ingress/egress for the resident that will need to have access maintained during construction.